Appl. No. 10/612,688
Amndt. dated October 14, 2005
Reply to Office Action of June 15, 2005

REMARKS / ARGUMENTS

In a second office action of June 15, 2005, the Examiner has removed his rejection of claims 1 - 3 based upon U.S. Patent No. 6,794,077. However, the Examiner has rejected claims 1 - 3 for new reasons. By the argument below, it is respectfully requested that the Examiner reconsider and remove his rejection of claims 1 - 3, and allow the pending claims.

II. INVENTION OVERVIEW:

The invention is a passive water management system for a fuel cell power plant that includes an anode fuel flow field adjacent a fuel cell electrolyte that defines a fuel path between a fuel inlet and a fuel outlet. The plant includes a cooler plate secured in heat exchange relationship with the anode fuel flow field and the cooler plate defines a coolant path between a coolant inlet and a coolant outlet. The fuel path has a width that is about the same as a width of the coolant path where the fuel path and the coolant path are closest to each other, and the fuel path substantially overlies the coolant path to minimize a temperature differential between fuel flowing through the fuel path and the closest cooling fluid flowing through the coolant path, thereby reducing evaporation of water from water management flow fields and/or the electrolyte into the fuel within the fuel path.

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II. RESPONSE TO OFFICE ACTION

In the second office action, the Examiner has rejected claims 1 and 2 under 35 U.S.C. 102(b) as anticipated by U.S. Patent 5,503,944 to Meyer et al. In essence the Examiner has asserted that Meyer et al. shows all of the elements of Applicant's claims 1 and 2. Specifically, the Examiner urges that "Meyer discloses a passive water management system (col. 2, ll. 12-14) comprising at least one fuel cell including an anode fuel flow plate 2', ... an anode water management flow field defined adjacent the anode flow field 2' including at least one fuel path between a fuel inlet and a fuel outlet for directing the fuel to flow adjacent to the electrolyte from the fuel inlet through the fuel path to the fuel outlet...." (Second office action at page 2, Sec. 2, emphasis added.)

While Meyers et al. does show some common elements with Applicant's claims 1 and 2, Meyers et al. fails to show or suggest a critical element of independent claim 1. In particular, the fuel path of Meyers et al. does not include a fuel outlet. At Col. 6, lines 43 - 45, of Meyers et al., it is pointed out that: "The anode flow fields 16' are dead-ended inside of the power plant." Meyers et al. previously pointed out that: "The plate 2' is also formed with ... a network of grooves 6' and 16' on its opposite surfaces. The grooves 6' form a portion of the water-coolant flow field, and the grooves 16' form the anode reactant flow field for each cell in the

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stack." (Meyers et al., Col. 6, lines 15 - 19.)

In describing operation of the Meyers et al. fuel cell, the effect of the "anode flow fields" being "dead-ended" is described at Col. 7, lines 10 - 17. "Any inert impurities found in the hydrogen fuel, such as helium, oxygen, carbon dioxide, and the like will diffuse through the membrane 8 since the hydrogen flow field 16' is dead-ended in the power plant. These impurities will then be flushed from the power plant by the air stream in the oxygen flow field 16, which air stream is vented to the ambient surroundings." (Id., emphasis added.)

Because the flow of the hydrogen fuel through the Meyers et al. flow field is "dead-ended" and unused impurities diffuse through the electrolyte into the "oxygen flow field", the Meyers et al. flow field therefore does not include a "fuel outlet" at one end of a "fuel path", through which the fuel flows. Applicant's claim 1 not only identifies a "fuel outlet (110)", it also discloses that the "fuel path" is defined between a "fuel inlet" and a "fuel outlet". "[T]he anode fuel flow field (14) (100) include[es] at least one fuel path (102) defined between a fuel inlet (108) and a fuel outlet (110) for directing the fuel to flow adjacent to the electrolyte (18) from the fuel inlet (108) to the fuel outlet (110)…." Moreover, the existence and location of the "fuel outlet" is a critical element, because "the fuel path (102) extending between the fuel inlet (108) and the fuel outlet (110) substantially overlies the coolant path

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(120) extending between the coolant inlet (126) and the coolant outlet (128)" in order to minimize a temperature differential between the fuel within the fuel path and a cooling fluid within the coolant path. In other words, the existence and location of a "fuel outlet" is a critical structural limitation that facilitates the achievement of the invention of claim 1. That the "fuel outlet" contributes to this critical structural limitation is further highlighted in the specification at page 13, lines 22 - 35, wherein it is pointed out that by use of the words "inlet" and "outlet", it is "meant that the flow of fuel through the fuel paths 102, 104, 106 from the fuel inlet 108 to the fuel outlet 110 is in the same direction as flow of the cooling fluid" from the coolant inlet to the coolant outlet. (Specification, page 10, lines 22-25.)

Furthermore, because the Meyer et al. fuel cell does not include a "fuel outlet", and instead the fuel flow field is "dead-ended", it is clear that the fuel cell of Meyer et al. simply does not teach a continuous flow path of fuel through the fuel cell. Therefore, not only does Meyer et al. not include all of the elements of Applicants' independent claim 1, it can also be concluded that Meyer et al. does not suggest Applicant's claimed structural limitations that provide the benefit of minimizing a temperature differential between a flowing fuel and a flowing cooling fluid. That is because nothing in Meyer et al. shows or suggests fuel flowing through the Meyer et al. fuel cell along a defined path from a fuel inlet to an outlet. Since

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fuel does not flow through the Meyer et al. fuel cell along a fuel path, there is no motivation or suggestion that evaporation of liquid into the Meyers et al. fuel could be minimized by a specific orientation of a flowing cooling fluid in a nearby coolant path.

Indeed, Figure 1 of Meyer et al. clearly teaches away from any such orientation by showing that a cooling fluid descends downward (in the Figure 1 view) into a top end of the fuel cell in line 54, while the fuel ascends upward into an opposed bottom end of the fuel cell in line 88. The cooling fluid is directed out of the Figure 1 fuel cell through a coolant outlet, while there is no outlet for the fuel in Figure 1. (Figure 3 of Meyer et al. shows both the fuel and cooling fluid schematically entering the fuel cell from the same bottom side, but as described above and as in Figure 1, no outlet for the fuel is shown, while the cooling fluid passes through an opposed top side.) Consequently, because the Meyers et al. fuel flow is "dead-ended", the Meyers et al. fuel cell is clearly incapable of benefiting from any cooperative orientation of the flow of the fuel and cooling fluid.

Therefore, Applicant's above described and claimed structural limitations that achieve Applicant's invention of claim 1 are neither shown nor suggested by Meyer et al. As recited in the Manual of Patent Examining Procedure at Section 2131: "To anticipate a claim, the reference must teach every

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element of the claim." Because Meyer et al. does not include a "fuel outlet", Meyer et al. does not include every element of Applicant's claim 1. Therefore, it is respectfully requested that Meyer et al. be removed as a reference.

Next, at section 3 of the second office action, the Examiner has rejected claim 3 as obvious in light of Meyer et al. (described above) in view of U.S. Patent 6,322,915 to Collins. Because Meyer et al. should be removed as a reference for the reasons recited above, and because claim 3 depends from and therefore narrows independent claim 1, it is urged that this rejection of claim 3 also be removed.

By this Amendment, Applicant has added new independent apparatus claim 4 and new independent method claim 5. Both new claims 4 and 5 include the above described limitation of a "fuel outlet". Antecedent bases for new apparatus claim 4 are found in the specification at Figure 2 that shows "Prior Art" having an "evaporation zone" at reference numeral 98, and at Figure 3 that shows an absence of the "evaporation zone"; in the specification at page 9, lines 4 - 26, describing the "prior art" evaporation zone; and, in the specification at page 10, lines 2 - 5 describing how the present invention "solves the problem of excessive evaporation." Antecedent bases for new method claim 5 are found in original claim 1, and in the specification at page 11, lines 8 - 27, and page 12, line 16 - page 13, line 14.

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III CONCLUSION

The undersigned expresses appreciation for removal of the rejection of all the then pending claims asserted in the first office action as a result of Applicants' response thereto. Now, by the present explanation of the distinctions between Applicant's pending claims 1 - 3 and the primary reference, Meyer et al., relied upon by the Examiner for rejecting claims 1-3, it is urged that claims 1 - 3 are now allowable. Moreover, new independent claims 4 and 5 simply present alternative claim language that embraces disclosed structures and methods of Applicant's specification, and therefore should be allowable. Accordingly, a Notice of Allowance is respectfully requested.

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